EVEN 2025-26 **EE19403/EE19R403**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Electrical Engineering (Sandwich Pattern)**
Course Title : **Illumination Engineering**

2:30 Hours / 60 marks Enrolment No. | | | | | | | | | | |

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate **full** marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. State different types of electronic dimmers available for illumination control. **[CO-3, L-R]**
b. State any two type of lighting schemes. **[CO-2,5, L-R]**
c. State the different types of arc lamps. **[CO-2, L-R]**
d. State any two methods used for light control. **[CO-3, L-R]**
e. Explain the concept of photometry. **[CO-1, L-R]**
f. State the recommended illumination level for i) Stage lighting ii) Operation theatre. **[CO-4, L-R]**
g. Draw circuit diagram of godown wiring. **[CO-4,5, L-R]**
h. State the lux level recommended for i) Street lighting ii) Flood lighting. **[CO-4,5, L-R]**
i. State the inverse square law of illumination. **[CO-1, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. State any four effects that can be obtained by lighting on stages. **[CO-4, L-R]**
b. Illustrate with neat wiring diagram a single lamp control by two point method. **[CO-3, L-R]**
c. Compare incandescent and fluorescent lamps. **[CO-2,5, L-R]**
d. State & explain the factors to be considered while selecting lamps for interior illumination. **[CO-4,5, L-I]**

Q. 3 Attempt any THREE **12 Marks**

a. Define the following terms i) Lumen ii) Illumination. **[CO-1, L-R]**
b. Explain the different methods of faced street lighting with neat diagram. **[CO-4,5, L-R]**
c. A 250V lamp has a total flux of 1500 lumens & takes a current of 0.4A. Calculate i) Lumen per watt ii) MSCP per watt. **[CO-1, L-A]**
d. State the purpose of flood lighting & also state any two applications of it. **[CO-4, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. State the concept of light pollution. **[CO-3, L-U]**

b. Select illumination level required as per ISI for following working plane in residential building i) Kitchen ii) Living room iii) Study room. **[CO-4,5, L-U]**

c. Draw construction of sodium vapour lamp and state any two applications of sodium vapour lamp. **[CO-2,5, L-U]**

d. State any three features of good illumination schemes. **[CO-1, L-U]**

e. State any two types lamps used in horticulture. State the requirement of horticulture lighting. **[CO-4, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. Enlist luminaries used in factory lighting and lux level required in various areas. **[CO-4, L-A]**

b. A workshop measures 10m×25m. The shop is illuminated by 24 lamps of 200watts each. The lumens efficiency of each lamp is 15 lumens per watt. Depreciation factor is assumed to be 0.8 and co-efficient of utilization of 0.5. Determine the illumination on working plane. **[CO-2,5, L-A]**

c. A drawing hall 30 meters by 15 meters with a ceiling height of 5 meters is to be provided with a general illumination of 120 lumens per m^2, taking a coefficient of utilization of 0.5 and depreciation factor of 1.4. Determine the number of fluorescent tubes required , their spacing, mounting height and total wattage. Take luminous efficiency of fluorescent tube as 40 lumens per watt for 80wat tubes. **[CO-4,5 L-A]**

****End****

EVEN 2025-26 EE19R208 | EE19208

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Electrical Engineering**
Course Title : **Electrical Circuits & Network**

2:30 Hours / 60 marks Enrolment No.

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. Draw phasor diagram for ac voltage applied to a resistor. **[CO-1, L-U]**
b. State the equation for instantaneous voltage of ac quantity. **[CO-1, L-R]**
c. Draw waveforms of v,i, & p for ac voltage applied to pure inductance. **[CO-1, L-U]**
d. Lit out various methods of solving AC parallel circuits. **[CO-2, L-R]**
e. Define : (i) Admittance (ii) Susceptance. **[CO-2, L-R]**
f. State the different types of three phase connections. **[CO-3, L-R]**
g. State Thevenin's theorem. **[CO-4, L-R]**
h. State superposition theorem. **[CO-4, L-R]**
i. State reciprocity theorem. **[CO-4, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. An AC series circuit consisting of R = 15Ω, L = 0.1H & C = 80μf is supplied from 230V, 50Hz power supply. Determine (i) Impedance of the circuit (ii) Current drawn (iii) Circuit power factor (iv) Reactive power drawn by circuit. **[CO-1, L-A]**
b. Explain graphical representation of parallel resonance. **[CO-2, L-U]**
c. Write the advantages of 3 phase circuit over single phase circuit. **[CO-3, L-U]**
d. Apply superposition theorem to compute current I in the network shown in fig.a. **[CO-4, L-A]**

Q. 3 Attempt any THREE **12 Marks**

a. A series R-L-C circuit consists of R = 15Ω, L = 0.5H & C = 25μf. If the circuit is supplied from 230V, 50Hz AC supply, determine (i) Circuit power factor (ii) Active power (iii) Reactive power (iv) Apparent power. **[CO-1, L-A]**
b. Two parallel impedances $Z_1 = (10-j8)\ \Omega$ & $Z_2 = (15-j10)\Omega$ are connected to 230V, 50Hz AC supply. Using admittance method, calculate branch currents, total current and power factor of whole circuit. **[CO-2, L-A]**
c. For network shown in fig.b determine value of R so that maximum power is delivered to it. Also compute the maximum power delivered. **[CO-4, L-A]**

d. Using Thevenin's theorem calculate the current flowing through the load connected across terminals A & B of the circuit shown in fig.c. **[CO-4, L-A]**

Q. 4 Attempt any FOUR **12 Marks**

a. With the help of power triangle explain active, reactive & apparent power in R-L series circuit. **[CO-1, L-U]**

b. State and explain (i) Power factor (ii) Q-factor of a coil. **[CO-1, L-R]**

c. Define : (i) Phase sequence (ii) Balance load (iii) Unbalanced load with respect to polyphase circuit. **[CO-3, L-U]**

d. A balanced star connected load of $(8+j6)\Omega$ per phase is connected to a balanced 3 phase 400V supply. Find the line current, power and power factor. **[CO-3, L-A]**

e. State and explain Norton's theorem. **[CO-4, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. An inductive coil having resistance of 5Ω & inductance of 0.2H is connected in series with a capacitor of $20\mu f$. If this combination is connected to 230V, variable frequency supply determine (i) Resonant frequency (ii) Quality factor (iii) Current at resonance (iv) Voltage across inductive coil at resonance. **[CO-1, L-A]**

b. Explain : (i) Admittance method to solve parallel A.C. circuit (ii) Parallel resonance. **[CO-2, L-U]**

c. Draw complete phasor diagram of voltages & currents for balanced delta connected load and prove the relation between (i) Line current and phase current (ii) Line voltage & phase voltage. **[CO-4, L-U]**

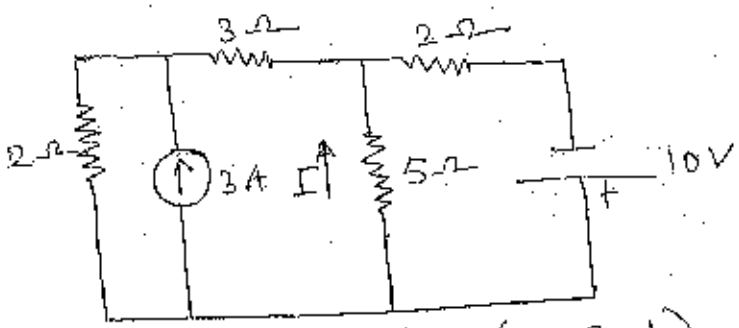


fig (a) (Q. 2-d)

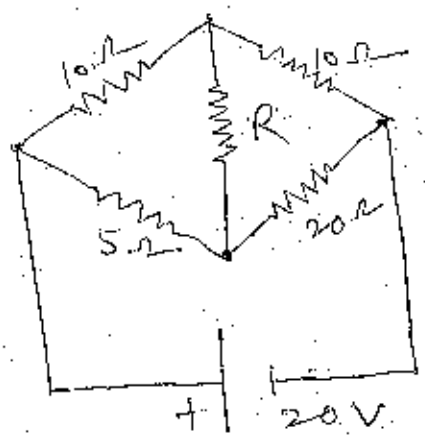


fig (b) (Q 3-c)

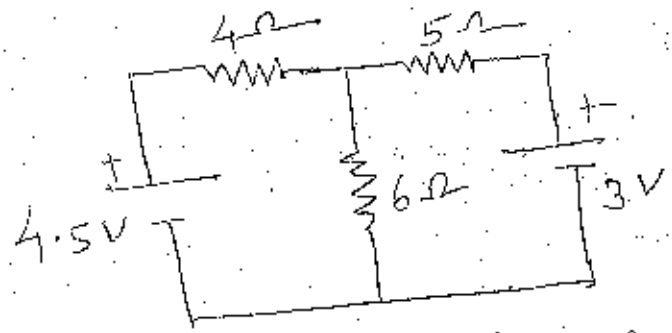


fig (c) (Q3-d)

****End****

EVEN 2025-26 **EE19307/EE19R307**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Electrical Engineering (Sandwich Pattern)**
Course Title : **Switchgear and Protection**

2:30 Hours / 60 marks Enrolment No.

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. State the function of basic elements of a protective system. **[CO-1, L-U]**
b. State any four differences between MCB and MCCB. **[CO-2, L-R]**
c. Draw a neat sketch of HRC fuse and label it. **[CO-2, L-U]**
d. State the term 'Sensitivity and Reliability' related to quality requirement of relay. **[CO-3, L-U]**
e. State the working principle of thermal relay. **[CO-3, L-U]**
f. Draw time-current characteristics of definite time over current relay. **[CO-3, L-U]**
g. State the causes of faults that can occur in transformer. **[CO-4, L-R]**
h. State the various protective schemes used in Induction motor. **[CO-5, L-R]**
i. Draw a neat sketch of fault bus protection scheme, and label it. **[CO-5, L-U]**

Q.2 Attempt any THREE **12 Marks**

a. With the help of diagram explain bus-bar current limiting reactor arrangement. **[CO-1, L-U]**
b. With the help of diagram state the terms: Arc voltage, Restriking voltage and Recovery voltage. **[CO-2, L-U]**
c. With the help of block diagram explain the working of static relay. **[CO-3, L-U]**
d. A 3-phase, 11kV/33kV, star-delta connected power transformer is protected by differential protection. CTs on LV side have current ratio of 400/5. What must be the current ratio of CTs, on HV side and how should they be connected ? **[CO-4, L-A]**

Q. 3 Attempt any THREE **12 Marks**

a. With the help of neat diagram explain Air blast C.B. **[CO-2, L-U]**
b. Determine the time of operation of a relay of rating 5A, 2.2 sec, IDMT type and having relay setting of 125%, TMS = 0.6. It is connected to a supply circuit through a C.T., having ratio of 400/5. The fault current is 4000 A. [operating time for PSM = 8 is 3.2 sec, (TSM = 1)] **[CO-3, L-A]**
c. Draw a neat sketch of Buchholz relay. Explain its working. **[CO-4, L-U]**
d. With the help of diagram explain distance protection to protect the transmission line. **[CO-5, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. Explain Type 1 and Type 2 insulation co-ordination. **[CO-2, L-U]**

b. Draw the flow chart of microprocessor based relay. State any two advantages of this relay. **[CO-3, L-U]**

c. State the working of differential microprocessor based relay. **[CO-3, L-U]**

d. Explain working of single phase preventer in case of 3-phase Induction motor. **[CO-5, L-U]**

e. Draw a neat sketch of three-stage transmission line protection. **[CO-5, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. A 10 MVA, 6.6 kV, 3-phase star connected alternator having a reactance of 20% is connected through a 5 MVA, 6.6 kV/33 kV transformer of 10% reactance to a transmission line having a resistance and reactance per conductor per kilometer of 0.2 ohm and 1 ohm respectively, 50km along the line, a short circuit occurs between the 3 conductors. Find the current fed to the fault by the alternator. **[CO-1, L-A]**

b. With the help of neat diagram, explain SF_6 gas circuit breaker. State their any four advantages. **[CO-2, L-U]**

c. A 3-phase, 10 MVA, 6.6 kV, generator is delivering a load of 8 MW at 0.8 p.f. Find the value of neutral resistance R_n if 10% of the winding is unprotected. The relay setting is 20%. The per phase reactance is 10%. **[CO-4, L-A]**

****END****

EVEN 2025-26

EE19R209/EE19209

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Electrical Engineering (Sandwich Pattern)**
Course Title : **DC Machines and Transformer**

2:30 Hours/ 60 marks Enrolment No. | | | | | | | | | | |

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L- LEVELS

Q.1 Attempt any SIX **12 Marks**

a. Compare Lap and Wave windings of DC machines (any two points). **[CO-1, L-U]**
b. State Fleming's right hand rule. **[CO-1, L-R]**
c. Draw the power stages of DC generator. **[CO-1, L-U]**
d. State the significance of back EMF. **[CO-2, L-R]**
e. State the necessity of starter in DC motor. **[CO-2, L-R]**
f. State the concept of ideal transformer. **[CO-3, L-R]**
g. State why transformer rating is in kVA. **[CO-3, L-R]**
h. State the criterion for selection of power transformer. **[CO-4, L-R]**
i. State the specifications of 3ph distribution transformer as per IS. **[CO-4, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Explain construction of DC machines with sketch and functions of each parts. **[CO-1, L-U]**
b. Derive an EMF equation of a DC generator. **[CO-1, L-U]**
c. Explain flux speed control method of DC shunt motor with neat diagram. **[CO-2, L-U]**
d. Explain the materials and functions of CRGO, CRNGO, HRGO, Amorphous cores of single phase transformer. **[CO-3, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. Determine the armature torque and shaft torque of 220V, 4-pole DC series motor with 800 conductors wave connected supplying a load of 8.2 kW by taking 45A from the mains. The flux per pole is 25 mWb and its armature resistance is 0.6 Ω. **[CO-2, L-A]**
b. Derive a EMF equation of a single phase transformer. **[CO-3, L-U]**
c. Explain direct loading test of a single phase 230/115 V, 1kVA, 50Hz transformer with neat diagram. **[CO-3, L-U]**
d. Explain Scott connection of three phase to two phase conversion of transformer with neat diagram. **[CO-4, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. A shunt generator delivers 195A at terminal p.d. of 250 V. The armature and shunt field resistances are 0.02 Ω and 50 Ω respectively. The iron and friction losses 950 W. Find (i) EMF generated (ii) Cu losses. **[CO-1, L-A]**

b. Draw the phasor diagram of 1ph transformer for inductive load. **[CO-3, L-U]**

c. Define voltage regulation and efficiency of 1ph transformer and state its formulas. **[CO-3, L-U]**

d. State three phase transformers connection with their applications. (any three) **[CO-4, L-U]**

e. State the conditions of parallel operation of three phase transformers. **[CO-4, L-R]**

Q. 5 Attempt any TWO **12 Marks**

a. State and explain the construction and state the methods to improve commutation. **[CO-1, L-U]**

b. Explain construction, working and applications of Brushless DC motor. **[CO-2, L-U]**

c. Obtain the equivalent circuit of a 200/400 V, 50Hz, 1ph transformer from the following test data : **[CO-3, L-A]**
O.C. Test : 200V, 0.7A, 70 W - on L.V. side
S.C. Test : 15V, 10A, 85 W – on H.V. side

****End****

EVEN 2025-26 **EE19401/EE19R401**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Electrical Engineering (Sandwich Pattern)**
Course Title : **Fundamental of Power Electronics**

2:30 Hours / 60 marks Enrolment No. | | | | | | | | | | |

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. Define holding and latching current. **[CO-1, L-R]**
b. Draw symbol of IGBT and LASCR. **[CO-1, L-R]**
c. State two applications of TRIAC. **[CO-1, L-R]**
d. Draw symbol of power transistor and DIAC. **[CO-1, L-R]**
e. State use of free wheeling diode in controlled rectifier. **[CO-3, L-R]**
f. State relation between firing angle and conduction angle with waveform. **[CO-3, L-U]**
g. What is inverter? Give its classification according to nature of input source. **[CO-3, L-R]**
h. Classify inverters based on the method of commutation used. **[CO-3, L-R]**
i. Define chopper. Give its classification. **[CO-3, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Describe working of protection circuit of SCR. **[CO-2, L-U]**
b. Explain chopper control techniques. **[CO-3, L-U]**
c. Explain snubber circuit for transistors. **[CO-4, L-U]**
d. How does thermal resistance affect heat dissipation in semiconductor devices? **[CO-4, L-A]**

Q. 3 Attempt any THREE **12 Marks**

a. Compare resistor triggering and RC triggering of SCR on any four points. **[CO-2, L-U]**
b. Differentiate between uncontrolled rectification and controlled rectification. **[CO-3, L-R]**
c. Explain working of single phase full bridge inverter with circuit diagram. **[CO-3, L-U]**
d. Compare step down and step up chopper on any four points. **[CO-3, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. List types of turn off methods of SCR. **[CO-2, L-R]**

b. Describe working principle of UJT triggering. **[CO-2, L-U]**

c. Compare between 3 phase and 1 phase converter. **[CO-3, L-U]**

d. State the advantages of pulse width modulation control in inverter. **[CO-3, L-A]**

e. Describe operation of series inverter with heat circuit diagram. **[CO-3, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. Draw labelled constructional diagram of SCR. Describe its operating principle with two transistor analogy. **[CO-1, L-U]**

b. With the help of circuit diagram and input output waveforms explain single phase fully controlled half wave converter with resistive load. **[CO-3, L-U]**

c. Draw and explain working of class A and class B choppers with circuit diagram and waveforms. **[CO-3, L-U]**

****End****

c. Draw wiring diagram of 1Ø energy meter & ICDP installation. **[CO-4, L-U]**
d. State the layouts of street lighting and draw sketch for any one layout. **[CO-5, L-U]**
e. List out and explain briefly the different materials required for overhead line. **[CO-6, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. Write tender notice and prepare quotation for electrical installation for (1BHK) residential units. **[CO-2, L-A]**
b. Design electrical installation scheme (layout and wiring diagram) of small industrial unit having 3 phase load of 30kW flour mill. Also prepare the list of materials required. **[CO-4, L-U]**
c. Explain following terms regarding street lighting. **[CO-5, L-U]**
   (i) Visual performance
   (ii) Visual comfort
   (iii) Glare
   (iv) Uniformity ratio

Q. 2 (c)

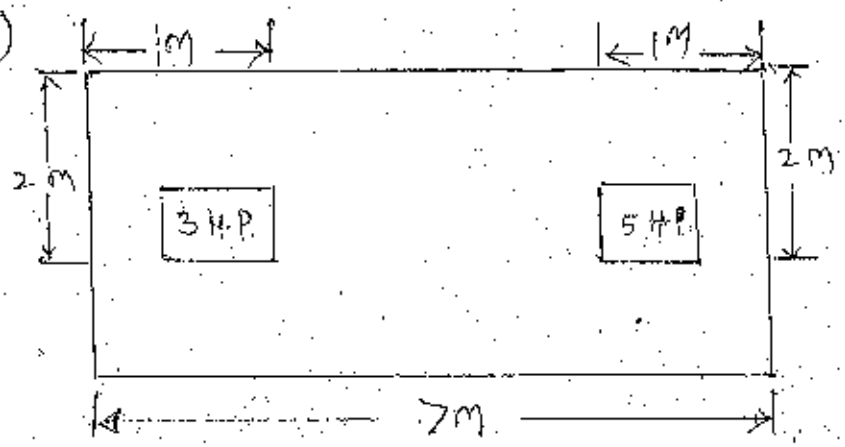


Figure 1

Q. 3 (a)

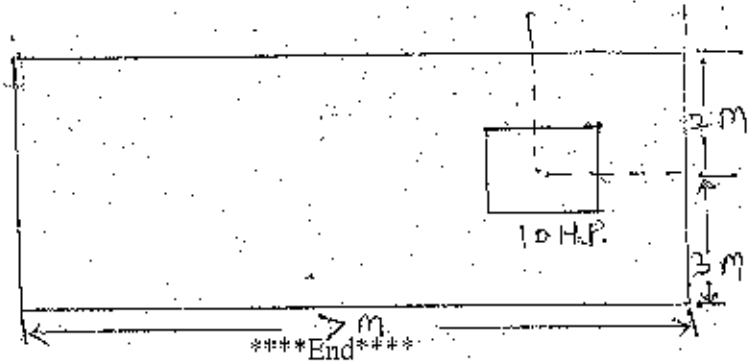


Figure 2

EVEN 2025-26

EE19304/EE19R304

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Electrical Engineering (Sandwich Pattern)**
Course Title : **Electrical Estimation and Costing**

2:30 Hours/ 60 marks Enrolment No.

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO- COURSE OUTCOMES, L- LEVELS

Q.1 Attempt any SIX **12 Marks**

a. State different types of electrical installations. **[CO-1, L-R]**
b. State the term supplementary estimate. State its two purpose. **[CO-2, L-R]**
c. State scope of national electric code 2011. **[CO-1, L-U]**
d. State the types of wring used in residential installation. **[CO-3, L-R]**
e. State four example of commercial installation. **[CO-3, L-U]**
f. State the precaution should be taken during electrical installation. **[CO-3, L-R]**
g. State how road/street lighting is different than interior lighting. **[CO-5, L-A]**
h. Classify the outdoor lighting installation. **[CO-5, L-R]**
i. State the factors for selection LT (415 V) power cables. **[CO-6, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. State comparison between tender and quotation (four points). **[CO-2, L-A]**
b. Explain the procedure to prepare a design for commercial electrical installation. **[CO-3, L-U]**
c. Prepare schedule of material for the industrial load as shown in figure 1. **[CO-4, L-A]**
d. Explain the list of material required for agricultural pump installation. **[CO-4, L-A]**

Q. 3 Attempt any THREE **12 Marks**

a. Estimate the cost of electrical installation for workshop as show in figure 2. **[CO-3, L-A]**
b. Prepare a list of materials and equipments required for public lighting installation. **[CO-5, L-U]**
c. State the different methods of cable termination of LT (415 V) line and explain any one method. **[CO-6, L-U]**
d. Compare underground line with overhead conductor line. (any four points) **[CO-6, L-A]**

Q. 4 Attempt any FOUR **12 Marks**

a. State the term target contract. State its advantages and disadvantages (each one). **[CO-2, L-U]**
b. In commercial installation which earthing is to be used and why? **[CO-3, L-A]**

EVEN 2025-26 EE19405/EE19R405

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Electrical Engineering (Sandwich Pattern)**
Course Title : **Industrial Automation**

2:30 Hours / 60 marks Enrolment No.

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. State the importance of automation. **[CO-1, L-R]**
b. State any two types of automation. **[CO-1, L-R]**
c. Enlist any four requirements of automation. **[CO-1, L-R]**
d. Define PLC. **[CO-2, L-U]**
e. State any two brands of PLCs available in the market along with its software name. **[CO-2, L-R]**
f. Enlist the names of any two softwares used in i) DCS ii) SCADA. **[CO-4, L-R]**
g. State the two types of potentiometer. **[CO-6, L-R]**
h. State any two advantages of pneumatic system. **[CO-7, L-R]**
i. State any two types of filters used in hydraulic system. **[CO-7, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Explain scan cycle of PLC. **[CO-2, L-U]**
b. State any four hardware components used in DCS. Also state their uses. **[CO-4, L-R]**
c. Classify the contacts according to application, position and load utilization categories. **[CO-5, L-A]**
d. Explain the working of double acting cylinder with neat diagram. **[CO-7, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. State the basic concept and rules of for ladder diagram. **[CO-3, L-R]**
b. i) State the uses of control transformer.
ii) Mention at least three specifications of control transformer. **[CO-5, L-R]**
c. Explain the working of vane pump. **[CO-7, L-U]**
d. Explain the working of spool valve. **[CO-7, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. Explain timer instructions i) TON ii) TOFF. **[CO-3, L-U]**
b. Explain counter instructions i) CTU ii) CTD. **[CO-3, L-U]**
c. Explain working of permanent magnet stepper motor. **[CO-6, L-U]**
d. Explain the application of potentiometer as an error detector. **[CO-6, L-A]**

c. Explain working of variable reluctance type steeper motor. **[CO-6, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. With the help of a neat block diagram, explain the structure of PLC. **[CO-2, L-U]**

b. Construct a PLC ladder program to control bottle filling plant. Explain the execution of the program. **[CO-3, L-A]**

c. Construct and explain the control circuit for conveyor belt. **[CO-5, L-A]**

****End****

EVEN 2025-26 EE19302 / EE19R302

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Electrical Engineering (Sandwich Pattern)**
Course Title : **Electrical Transmission & Distribution**

2:30 Hours / 60 marks Enrolment No.

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO-COURSE OUTCOMES, L-LEVELS

Q.1 Attempt any SIX **12 Marks**

a. Enlist different types of conductors used in the transmission system. **[CO-1, L-R]**
b. State skin effect. State the parameters on which skin effect depends. **[CO-1, L-R]**
c. State the methods of reducing corona. **[CO-1, L-R]**
d. State Ferranti effect. **[CO-1, L-R]**
e. State the different voltage levels of HVDC transmission system. **[CO-1, L-R]**
f. State the factors for design consideration of feeders. **[CO-1, L-U,R]**
g. State the components of distribution system. Draw its diagram. **[CO-1, L-U]**
h. Compare overhead wires with cable on any two aspects. **[CO-1, L-U]**
i. State the classification of cable. **[CO-1, L-U]**

Q.2 Attempt any THREE **12 Marks**

a. Explain RCC poles with diagram. State its disadvantages. **[CO-1, L-U]**
b. Define corona. Explain on which factors corona depends. **[CO-1, L-U]**
c. Explain the construction of a cable with neat diagram. **[CO-1, L-U]**
d. Explain causes of low power factor. **[CO-4, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. Compare between EHVAC & HVDC on any eight aspects. **[CO-3, L-U]**
b. Explain bipolar HVDC system with neat diagram. **[CO-1, L-U]**
c. Explain Ring Mains system of distribution system. **[CO-1, L-U]**
d. Explain static capacitor for p.f improvement. **[CO-4, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. Compare Pin type & Suspension type insulators on any three aspects. **[CO-1, L-U]**
b. Draw circuit diagram & phasor diagram of nominal 'T' circuit of medium transmission line. **[CO-1, L-U]**
c. State the function of Line In Line out system with diagram. **[CO-1, L-U]**
d. State the classification of distribution system. **[CO-1, L-R]**
e. Enlist the different important substation equipments. **[CO-4, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. In a 3ph, 33kV overhead line, there are 3 units in the string of insulator. If the capacitance between each insulator pin and earth is 12% of self capacitance of each insulator, find i) The distribution of voltage over 3 insulator ii) String efficiency. **[CO-2, L-A]**

b. A 3 phase transmission line has a resistance of 1.5Ω & reactance of 4Ω per phase. Calculate percentage regulation & efficiency at a load of 5000 kW at 0.8 lagging p.f. The voltage at the far end is 11 kV. **[CO-2, L-A]**

c. Explain method of solving AC distribution problems when power factors referred to receiving end are given. Write all formulas. Draw the phasor diagram. **[CO-2, L-A]**

****End****

EE19R207

EVEN 2025-26

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Electrical Engineering (Sandwich Pattern)**
Course Title : **Electrical Power Generation**

2:30 Hours / 60 marks Enrolment No.

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. State any two types of boilers used in thermal power station. **[CO-1, L-R]**
b. State the name of two thermal power plants with their capacities situated in Maharashtra. **[CO-1, L-R]**
c. State two major components of thermal power station. **[CO-2, L-R]**
d. State the purpose of spill ways. **[CO-2, L-R]**
e. State two types of water turbines used in hydro power plant. **[CO-2, L-R]**
f. State the types of solar power plants. **[CO-1, L-R]**
g. State any two safe practices to be followed in solar power plants. **[CO-4, L-R]**
h. State the name of two wind power plants with their capacities situated any where in India. **[CO-1, L-R]**
i. State the types of wind turbine. **[CO-2, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Describe the working of super critical technology in thermal power generation plant. **[CO-3, L-U]**
b. Explain the concept of atomic fusion and fission action. **[CO-3, L-U]**
c. Explain the function of following i) Reservoir ii) Surge tank iii) Penstock iv) Dam. **[CO-3, L-U]**
d. State any four major equipment used in PV solar power plant with function. **[CO-4, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. Describe the desired properties of coal to be used as fuel in the thermal power plant. **[CO-3, L-U]**
b. Describe the procedure of the disposal of nuclear waste generated in a nuclear power plant. **[CO-4, L-A]**
c. Describe the classification of hydro power plants on the basis of different criteria. **[CO-3, L-U]**
d. Explain the hybrid system of solar power generation. **[CO-3, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. With the help of a neat diagram explain the stages of power conversion in thermal power plant. **[CO-3, L-A]**

b. Explain any one type of solar power collector with diagram. **[CO-2, L-U]**

c. Explain horizontal axis wind turbine with diagram. **[CO-2, L-U]**

d. State any three salient features of electrical generator used in a large wind power plant. **[CO-3, L-U]**

e. State six safe practices to the followed in wind power plant. **[CO-4, L-R]**

Q. 5 Attempt any TWO **12 Marks**

a. Describe the purpose & working of pumped hydro power plant. **[CO-3, L-A]**

b. Describe the step by step procedure of power generation in wind power plant with a block diagram. **[CO-3, L-A]**

c. With the help of layout explain working of a typical thermal power plant. **[CO-3, L-A]**

****End****

EVEN 2025-26

EE19301/EE19R301

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Electrical Engineering(Sandwich Pattern)**
Course Title : **Electrical and Industrial measurement**

2:30 Hours/ 60 marks Enrolment No. | | | | | | | | | |

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. State types of static error.. **[CO-1, L-R]**
b. Enlist types of torque in analog instrument. **[CO-1, L-R]**
c. State the principle of PMMC. **[CO-2, L-R]**
d. State the methods of measurement of low and high resistance. **[CO-2, L-R]**
e. State concept of power in a.c. circuit. **[CO-2, L-R]**
f. Draw diagram of measurement of power in 3 phase circuit by two wattmeter method for balanced load. **[CO-3, L-R]**
g. State any two advantages of electronic energy meter over induction type energy meter. **[CO-4, L-R]**
h. Define Transducer. **[CO-5, L-R]**
i. State working principle of LVDT. **[CO-5, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Explain classification of instrument. **[CO-1, L-U]**
b. Compare PMMC with Electro-dynamometer type instrument (any 4 points). **[CO-2, L-U]**
c. Explain principle of operation and working of dynamometer type wattmeter. **[CO-2, L-U]**
d. State comparison between Active and Passive Transducer (Any 4). **[CO-5, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. A moving coil milliammeter having a resistance of 10 ohms gives full scale deflection when a current of 5mA is passed through it. Explain how this instrument can be used for measurement of 1) Current up to 1 A 2) Voltage up to 5 V. **[CO-3, L-A]**
b. Explain principle of operation and working of single phase bidirectional type energy meter. **[CO-2, L-U]**
c. Explain classification of transducer with an example of each. **[CO-5, L-A]**
d. Draw suitable and explain thermistor. **[CO-5, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. Explain methods of extension of range of ammeter with diagram. **[CO-2, L-U]**

b. Explain measurement of power in 3 phase circuit by the three wattmeter method for balanced load with diagram. **[CO-3, L-U]**

c. Explain measurement of reactive power in three phase balance load by one wattmeter method. **[CO-3, L-U]**

d. Explain calibration of energy meter with diagram. **[CO-4, L-A]**

e. Explain working principle of single phase induction type energy meter with neat diagram. **[CO-4, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. Explain use and advantages of :
(i) Clamp on meter
(ii) Digital multimeter
(iii) Digital earth tester. **[CO-2, L-U]**

b. Draw and explain construction and working operation of optical pyrometer. **[CO-5, L-U]**

c. Define strain gauge, state types of strain gauge. Explain semiconductor strain gauge. **[CO-5, L-U]**

****End****

EVEN 2025-26 **EE23105**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Electrical Engineering (Sandwich Pattern)**
Course Title : **Electrical Circuit & Network**

2:30 Hours / 60 marks Enrolment No.

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. Obtain A + B, where A = 5 + j10 and B = 10 ∠ -20^0. **[CO-1, L-A]**
b. Give the voltage and current equation for an AC through pure inductive circuit. **[CO-1, L-U]**
c. Define quality factor of series A.C. circuit. **[CO-1, L-R]**
d. Define impedance and state its unit. **[CO-1, L-R]**
e. Define susceptance and admittance for parallel circuit. **[CO-2, L-R]**
f. State 'Q' factor for parallel R-L-C circuit. **[CO-2, L-R]**
g. Define phase sequence and write the phase difference between each phase of 3ϕ supply. **[CO-3, L-R]**
h. Define : (i) Node (ii) Mesh. **[CO-4, L-R]**
i. State Norton's theorem. **[CO-4, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. For the given impedance triangle showing in fig.1 **[CO-1, L-U]**
   (i) Identify the circuit
   (ii) Mark parameters of all sides of triangle
   (iii) State the nature of power factor
   (iv) Draw sinusoidal waveform for voltage and current
b. Explain parallel equivalent of a series circuit. **[CO-2, L-U]**
c. Explain the concept of balanced load and unbalanced load. **[CO-3, L-U]**
d. Write the steps for finding the current through an element by Thevenin's theorem. **[CO-4, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. A series R-L-C circuit consist of R = 15Ω, L = 0.5H & C = 25μF. If the circuit is supplied from 230V, 50Hz, supply determine : (i) Power factor (ii) Active power (iii) Reactive power (iv) Apparent power. **[CO-1, L-A]**
b. Two parallel impedance $Z_1 = (10 + j8)\ \Omega$ & $Z_2 = (15 - j10)\ \Omega$ are connected to 230V, 50Hz, AC supply. Using admittance method. Calculate branch, currents, total current and power factor of whole circuit. **[CO-2, L-A]**
c. Explain principle of generation of 3ϕ alternating emf. **[CO-3, L-U]**
d. State superposition theorem. Write steps to find current in an element using superposition theorem. **[CO-4, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. Draw circuit diagram, phasor diagram and waveform of voltage and current of series R-C circuit. **[CO-1, L-U]**

b. Define the power factor of resonant circuit. State the value of power factor at resonance. **[CO-2, L-U]**

c. Compare series and parallel resonance on basis of following : (i) Power factor (ii) Resonant frequency (iii) Impedance (iv) Current. **[CO-2, L-U]**

d. Write any three advantages of polyphase circuit over single phase circuit. **[CO-3, L-U]**

e. Explain the necessary conditions for maximum power to be transferred to the load. **[CO-4, L-U]**

Q. 5 Attempt any TWO **12 Marks**

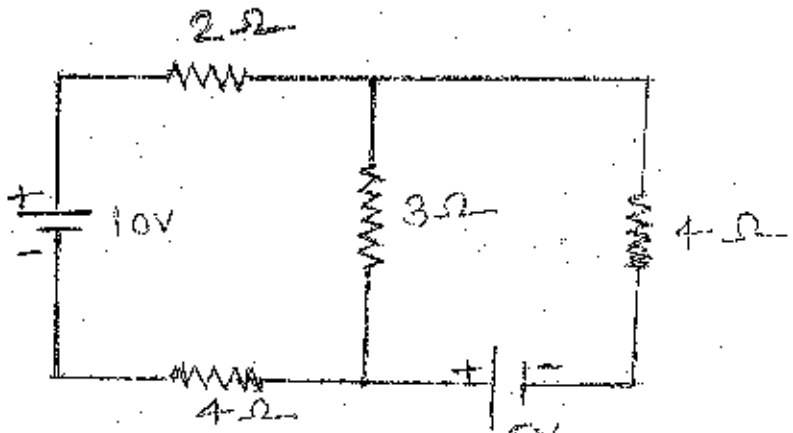
a. Explain graphical representation of resonance for series R-L-C circuit. State variation of resistance, inductive reactance X_L and capacitive reactance X_C with frequency. **[CO-1, L-U]**

b. Using superposition theorem find current in 3Ω resistor in fig.2 and also state any two drawbacks of superposition theorem. **[CO-4, L-A]**

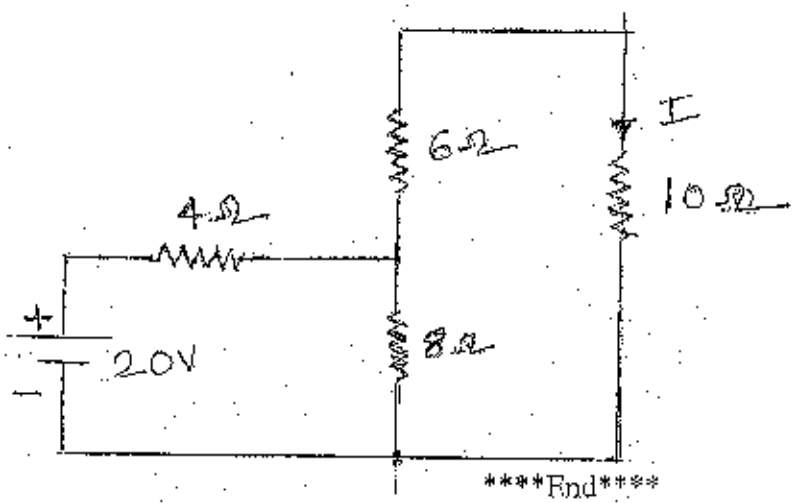
c. Verify reciprocity theorem for voltage and current shown in fig.3. **[CO-4, L-A]**



Q.2(a) Fig①



Q.5(b) Fig②



Q.5(c) fig③

****End****

EVEN 2025-26

EE19308

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Electrical Engineering**
Course Title : **Testing & Maintenance of Electrical Equipment**

2:30 Hours / 60 marks Enrolment No.

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary.
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 **Attempt any SIX** **12 Marks**

a. Define responsibility and authority in reference to the safety. **[CO-1, L-R]**
b. Enlist any four types of fire extinguisher. **[CO-1, L-R]**
c. State the objectives of testing. **[CO-2, L-R]**
d. Define tolerance and write the name of IS standard in which values of tolerances are specified. **[CO-2, L-R]**
e. Draw a neat labelled waveform of impulse voltage applied to transformer during lightening impulse test. **[CO-2, L-R]**
f. Enlist the routine tests performed on transformer. **[CO-2, L-R]**
g. Enlist the tests performed on induction motor for drawing circle diagram. **[CO-3, L-R]**
h. Enlist the factors affecting life of insulating material. **[CO-4, L-R]**
i. Write the tests carried out on transformer oil (any four). **[CO-4, L-R]**

Q.2 **Attempt any THREE** **12 Marks**

a. Write any four reasons of electric fire. **[CO-1, L-R]**
b. Compare routine maintenance and break down maintenance (any four points). **[CO-2, L-A]**
c. Draw neat labelled circuit diagrams of open circuit and short circuit tests performed on 1 phase transformer. Also write the formulae for deriving parameters of equivalent circuit. **[CO-2, L-U]**
d. Explain polarity test performed on transformer with neat circuit diagram. **[CO-2, L-U]**

Q. 3 **Attempt any THREE** **12 Marks**

a. Write any four abnormal conditions and their protections in transformer. **[CO-3, L-A]**
b. Explain the insulation resistance test performed on induction motor with neat circuit diagram. **[CO-2, L-U]**
c. Describe reduced voltage running test on induction motor with neat circuit diagram. **[CO-2, L-U]**
d. Explain the methods of cleaning insulation. **[CO-5, L-A]**

Q. 4 Attempt any FOUR **12 Marks**

a. Explain the measurement of DC resistance of winding test of transformer. **[CO-2, L-U]**

b. Write the causes of failure in transformer. **[CO-2, L-R]**

c. Give the methods of measuring temperature of windings of induction motor. **[CO-4, L-R]**

d. Enlist the type tests performed on single phase induction motor. **[CO-2, L-R]**

e. Explain the methods of drying of insulation. **[CO-5, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. Explain pipe earthing with neat labelled diagram. **[CO-1, L-U]**

b. Prepare a trouble-shooting table for transformer containing any eight troubles and their remedies. **[CO-4, L-A]**

c. Prepare a trouble shooting chart for synchronous machines containing any eight troubles and/or abnormal conditions and their remedies and/or protections. **[CO-4, L-A]**

****End****

EVEN 2025-26 EE19R306 / EE19306

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Electrical Engineering (Sandwich Pattern)**
Course Title : **A.C. Machines**

2:30 Hours / 60 marks Enrolment No.

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. State the main parts of 3-ϕ I.M. How theses 3- ϕ I.M. are classified? **[CO-1, L-R]**
b. State two important conclusions of rotating magnetic field. **[CO-1, L-R]**
c. Draw power stages of 3- ϕ I.M. **[CO-1, L-U]**
d. State the effect of change in supply voltage and rotor power factor on torque. **[CO-1, L-U]**
e. State the concept of double cage 3- ϕ I.M. **[CO-2, L-R]**
f. State any two advantages of stationary armature in case of 3- ϕ alternator. **[CO-3, L-R]**
g. State any four necessary conditions to run 3- ϕ alternators in parallel. **[CO-3, L-U]**
h. State any two methods to start 3- ϕ, synchronous motor. **[CO-4, L-R]**
i. Compare 1- ϕ I.M. and 3- ϕ I.M. on any four features. **[CO-5, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. A 4 pole, 50Hz, 3- ϕ I.M. has a full load slip of 5%. Each rotor phase has a resistance of 0.3Ω and a stand still reactance of 1.2Ω. Find the ratio of maximum torque to full load torque and the speed at which the maximum torque occur. **[CO-1, L-U]**
b. Derive the equivalent circuit of 3- ϕ I.M. **[CO-2, L-U]**
c. A 6-pole machine has an armature of 90 slots and 8 conductors/slot and revolves at 1000 rpm, the flux per pole being 50 mWb. Calculate the emf generated as 3- ϕ star connected machine if the winding factor is 0.96 and all the conductors in each phase are in series. **[CO-3, L-A]**
d. State all four types of torque of a 3- ϕ synchronous motor. **[CO-4, L-R]**

Q. 3 Attempt any THREE **12 Marks**

a. Explain the rotor resistance control to control the speed of 3- ϕ slip ring I.M. State any two drawbacks of this method. **[CO-2, L-U]**
b. Explain the procedure to calculate voltage regulation of 3- ϕ alternator by MMF or ampere turn method with necessary graphs or phasor diagram. **[CO-3, L-U]**
c. Explain the effect of change of excitation at constant load in case of 3- ϕ synchronous motor. **[CO-4, L-U]**

d. With the help of neat diagram explain the working of capacitor split phase 1- ϕ I.M. **[CO-5, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. An 8 pole alternator runs at 750 rpm and supplies power to a 6-pole 3- ϕ I.M. which has a full load slip of 3% Calculate the full-load speed of the motor. **[CO-1, L-A]**

b. A 3- ϕ, 6-pole, 50Hz, I.M. take 60A at full load speed 940 rpm and develops a torque of 150N-m. The starting current at rated voltage is 300A. What is the staring torque if star delta starter is used? **[CO-2, L-A]**

c. Derive the equation for distribution factor Kd in case of 3- ϕ alternator. **[CO-3, L-U]**

d. Draw 'V' curve and inverted V curve with their parameters of 3- ϕ synchronous motor. **[CO-4, L-R]**

e. Explain the concept of shaded pole 1- ϕ I.M. **[CO-5, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. A 50 Hz 8-pole, 3 ϕ I.M. has a full load slip of 4%. The rotor resistance is 0.001 ohm/phase and stand still reactance is 0.005 ohm/ph. Find the ratio of the maximum to the full load torque and the speed at which the maximum torque occurs. **[CO-1, L-A]**

b. Draw the circle diagram for full load condition for a 3.73 kW, 200V, 50Hz, 4-pole, 3- ϕ star connected I.M. The readings of tests are as follows:
No load test– line voltage 200V, line current 5A, total i/p – 350W,
Blocked rotor test – line voltage 100V, line current 26A, total i/p – 1700W.
Also estimate the line current and p.f. for full load condition. **[CO-2, L-A]**

c. Explain one dark two bright lamp method of synchronization with neat circuit diagram. **[CO-3, L-U]**

****END****

EVEN 2025-26 **EE19406/EE19R406**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Electrical Engineering (Sandwich Pattern)**
Course Title : **Electric Mobility**

2:30 Hours / 60 marks Enrolment No.

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. List four main pollutants released in atmosphere due to combustion of hydrocarbon in IC engine vehicle (ICEV) **[CO-1, L-R]**
b. State the effects of nitrogen oxides (NOx) on human health and environment (any two). **[CO-1, L-U]**
c. Define global warming. **[CO-1, L-U]**
d. Define acid rain. State its effect. **[CO-1, L-R]**
e. Define Tractive force. **[CO-2, L-U]**
f. Define specific energy of battery. State its unit. **[CO-4, L-U]**
g. Define state of charge (SOC) of battery. State its unit. **[CO-4, L-U]**
h. Classify the converter according to power flow and magnetic isolation. **[CO-5, L-U]**
i. State any two requirements of converter for on board charger. **[CO-5, L-U]**

Q.2 Attempt any THREE **12 Marks**

a. Compare Micro, Mild and Full hybrid HEV. **[CO-1, L-U]**
b. With the help of neat architectural diagram illustrate working of PHEV. **[CO-1, L-A]**
c. State two advantages and two disadvantages of Vector method to control the speed of induction motor. **[CO-3, L-R]**
d. Draw a neat schematic diagram of EV configuration based on power electronics. **[CO-5, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. Explain the working of ERFV. **[CO-1, L-U]**
b. Draw a neat block diagram of Electric propulsion system. **[CO-2, L-R]**
c. Explain the construction and working of Switched reluctance motor. **[CO-3, L-U]**
d. Explain Inductive charging for EV. State its two advantages. **[CO-4, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. Write the equation of Aerodynamic drag force. State the meaning of each term. **[CO-2, L-A]**

b. Write the equation of maximum tractive force for front wheel driven vehicle and on rear wheel driven vehicle. Write meaning of each term. **[CO-2, L-R]**

c. Explain direct toque control method to control speed of induction motor with neat block diagram. **[CO-3, L-U]**

d. Explain construction of Permanent Magnet synchronous motor. **[CO-3, L-U]**

e. State and explain any three benefits of isolated converter. **[CO-5, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. Explain FOC method to control the speed of PMSM with neat block diagram. **[CO-3, L-U]**

b. (i) State minimum eight functions of battery management system.
(ii) With the help of neat block diagram illustrate its working. **[CO-4, L-A]**

c. (i) What is battery swapping?
(ii) State its types.
(iii) State four advantages and four challenges for battery swapping. **[CO-4, L-U]**

****END****

EVEN 2025-26

EE19210 / **EE19R210**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Electronics Engineering(Sandwich Pattern)**
Course Title : **Fundamentals of Electrical Engineering**

2:30 Hours/ 60 marks Enrolment No.

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. Define (i) Electric current (ii) Electric potential. **[CO-1, L-R]**
b. Write statement of Faraday's law of electromagnetic induction. **[CO-3, L-R]**
c. Define (i) Absolute permeability (ii) Relative permeability. **[CO-3, L-R]**
d. State Ohm's law. **[CO-1, L-R]**
e. State mathematical expression of A.C. voltage. **[CO-4, L-R]**
f. Define (i) Node (ii) Loop for a circuit. **[CO-1, L-R]**
g. Write statement of Kirchhoff's voltage law. **[CO-1, L-R]**
h. Name the losses in transformer. **[CO-5, L-R]**
i. State different types of fuses. **[CO-6, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Refer fig.1 and find equivalent resistance between A and B. **[CO-2, L-A]**
b. Explain concept of statically induced EMF with neat diagram. **[CO-3, L-U]**
c. Draw circuit diagram of A.C. circuit with pure resistance, waveform and phasor diagram. **[CO-4, L-U]**
d. Explain operation of MCB with neat labeled diagram. **[CO-6, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. If 10 meters of manganin wire 0.13m in diameter has a resistance of 3.4ohms. Find specific resistance of the material. **[CO-1, L-A]**
b. State and explain Flemings left hand rule. **[CO-3, L-R]**
c. An alternating voltage is given by $v(t) = 141.4 \sin 314t$ find. **[CO-4, L-A]**
   (i) Maximum value (ii) Frequency (iii) Time period (iv) R.M.S. value of voltage.
d. Compare auto transformer with two winding transformer (any four points) **[CO-5, L-A]**

Q. 4 Attempt any FOUR **12 Marks**

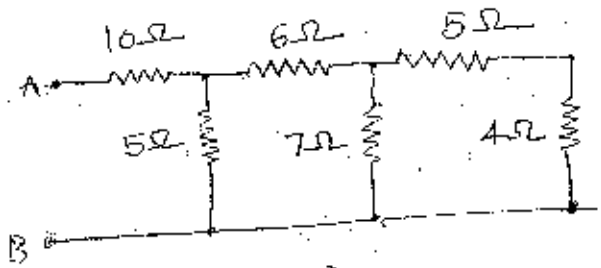
a. Define (i) Instantaneous value (ii) Time period (iii) Frequency. **[CO-4, L-R]**
b. State power factor and give its significance. **[CO-4, L-R]**
c. Compare magnetic circuit and electric circuit. **[CO-3, L-A]**
d. State and explain KVA rating of a transformer. **[CO-5, L-R]**
e. State precautions to be taken if a person gets an electric shock. **[CO-6, L-R]**

Q. 5 Attempt any TWO **12 Marks**

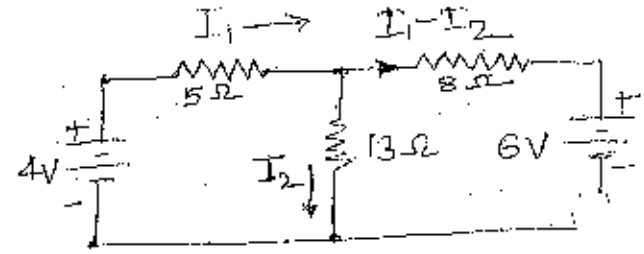
a. Explain following effects of electric current with example. **[CO-1, L-R]**
   (i) Heating effect (ii) Magnetic effect

b. Refer fig.2 and find value of I_1 using KVL. **[CO-2, L-A]**

c. Draw and explain construction of transformer. **[CO-5, L-U]**



Q. 2(a) Fig (1)



Q. 5(b) Fig (2)

****End****

EVEN 2025-26 **EE23112**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Electrical Engineering (Sandwich Pattern)**
Course Title : **Switchgear & Protection**

2:30 Hours / 60 marks Enrolment No. | | | | | | | | | | |

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO-COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. Enlist the various types of faults that can occur in a power system. **[CO-1, L-R]**
b. State the need of current limiting reactors. **[CO-1, L-R]**
c. List out different types of fuses used in power system. **[CO-2, L-U]**
d. State the sequence of operation of a circuit breaker, isolater and earthing switch, during opening and closing of the lines during fault.**[CO-2, L-U]**
e. Enlist all the desirable characteristics of a protective relay. **[CO-3, L-R]**
f. Draw the basic connection diagram of trip circuit. **[CO-3, L-U]**
g. Enlist the important faults that can occur in an alternator. **[CO-4, L-R]**
h. State the difficulties occurring in simple differential protection for transformer. **[CO-4, L-U]**
i. Enlist the special features to be considered while protecting a transmission line. **[CO-5, L-U]**

Q.2 Attempt any THREE **12 Marks**

a. State the concept of a protection zone in a power system. Why it is important to have overlapping between adjacent protection zones? **[CO-1, L-U]**
b. State the importance of insulation coordination. **[CO-2, L-R]**
c. With the help of block diagram state the working of microprocessor based over current relay. **[CO-3, L-U]**
d. Explain how alternator is protected against field failure (rotor winding). **[CO-4, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. State the concept back-up protection. Give two examples of situation where back-up protection operates. **[CO-1, L-U]**
b. State the advantages of static relay over electromagnetic relay. **[CO-3, L-U]**
c. State the term PSM and TMS with respect to protective relays. **[CO-3, L-U]**
d. With a neat diagram state how distance protection is provided for a transmission line. **[CO-5, L-A]**

Q. 4 Attempt any FOUR **12 Marks**

a. Enlist the various types of lightening arresters. **[CO-2, L-U]**

b. Define i) Restriking voltage ii) Recovery voltage with respect to circuit breaker. **[CO-2, L-R]**

c. Draw circuit diagram of simple differential protection of transformer. **[CO-4, L-U]**

d. Draw a neat diagram to show fault bus protection while providing protection to a bus-bar. **[CO-5, L-A]**

e. State the effects of single-phasing in an induction motor. **[CO-5, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. With a neat diagram state the working principle of SF_6 circuit breaker. **[CO-2, L-U]**

b. With a neat diagram state the principle of operation of time-distance impedance relay in brief (for transmission line). **[CO-3, L-U]**

c. Explain working of buchholz relay with its constructional diagram. **[CO-4, L-U]**

****End****

EVEN 2025-26

EE23115

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Electrical Engineering**
Course Title : **Industrial Control And Automation**

2:30 Hours / 60 marks Enrolment No.

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. Draw the symbols of i) Limit Switch ii) Pressure Switch iii) Liquid Level Switch iv) No Contact **[CO-1, L-R]**
b. Differentiate between Control, and Power circuit on any two points. **[CO-1, L-U]**
c. State any two types of servo motor. **[CO-2, L-U]**
d. State any two brands of PLCs available in the market. **[CO-3, L-U]**
e. State the function of ADC and DAC in PLC. **[CO-3, L-U]**
f. State any four programming languages for PLC. **[CO-4, L-U]**
g. Draw ladder diagram for AND gate. **[CO-4, L-R]**
h. Draw the symbol for following Bit type instructions:- i) XIC ii) XIO. **[CO-4, L-R]**
i. Draw anatomy of a ladder diagram. **[CO-4, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Draw and explain control circuit for skip hoist. **[CO-1, L-R]**
b. Explain working of Accumulator in Hydraulics. **[CO-2, L-U]**
c. Draw the block diagram of PLC and explain function of each block in brief. **[CO-3, L-U]**
d. State any four advantages of PLC based automation over relay based automation. **[CO-3, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. Explain the working of FRL unit in Pneumatic system. **[CO-2, L-U]**
b. Explain the working of double acting cylinder. **[CO-2, L-U]**
c. Compare PC and PLC on the basis of any eight features. **[CO-3, L-U]**
d. Explain the Input module and the Output module in PLC. **[CO-3, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. Draw a neat labeled diagram of Power circuit of soft starter. **[CO-1, L-R]**

b. Explain how ladder logic is executed with the help of an example. **[CO-4, L-U]**

c. Explain scaling instruction SLP. **[CO-4, L-U]**

d. Define SCADA and state its two applications. **[CO-5, L-U]**

e. State the names of any three software used in SCADA. **[CO-5, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. Explain the working of Shaper circuit with neat diagram. **[CO-2, L-U]**

b. Write a PLC program for temperature control (ON/OFF). **[CO-4, L-A]**

c. Explain the SCADA hardware components. **[CO-5, L-U]**

****End****

EVEN 2025-26 **EE23103**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Electrical Engineering (Sandwich Pattern)**
Course Title : **Electrical Power Generation**

2:30 Hours / 60 marks Enrolment No. | | | | | | | | |

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. State any two names of coals with calorific value used in thermal power plant. **[CO-1, L-R]**
b. State any two types of boilers used in the thermal power plant. **[CO-2, L-R]**
c. State any two major components of nuclear power plant. **[CO-2, L-U]**
d. Name two nuclear power plants with their capacity situated in India. **[CO-1, L-R]**
e. Name two thermal power plants with their capacity situated in Maharashtra. **[CO-1, L-R]**
f. List four safe practices to be followed in nuclear power plant. **[CO-4, L-R]**
g. State the primary source of energy in hydro power plant. **[CO-2, L-U]**
h. State the role of penstock in hydro power plant. **[CO-3, L-U]**
i. State the purpose of solar maps. **[CO-2, L-U]**

Q.2 Attempt any THREE **12 Marks**

a. State the types of steam turbines and explain the working of any one of them. **[CO-2, L-U]**
b. Describe the logic behind storing water at height for hydro power generation. **[CO-2, L-U]**
c. Explain the stand alone type solar power plant. **[CO-2, L-U]**
d. Differentiate between horizontal axis wind turbine and vertical axis wind turbine on any four points. **[CO-2, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. Describe the role of control rods in nuclear reactor. **[CO-3, L-A]**
b. Differentiate run off river water plant from storage type of hydro power plant. **[CO-2, L-U]**
c. Draw a layout of grid connected solar photovoltaic power plant & explain its working. **[CO-2, L-U]**
d. State and explain the common sources of biomass fuels. **[CO-1, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. State and explain the purpose of moderator in nuclear power plant. **[CO-3, L-A]**

b. State four safe practices to be followed in hydro power plant. **[CO-2, L-U]**

c. State the types of solar power collectors and explain any one. **[CO-2, L-U]**

d. State any four safe practices to be followed in wind power station. **[CO-4, L-U]**

e. Explain the energy conversion process in biomass based power plant. **[CO-2, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. With the help of neat diagram explain the working of coal handling plant of a thermal power plant. **[CO-2, L-U]**

b. With the help of a neat diagram explain the working of horizontal axis wind turbine. **[CO-2, L-U]**

c. Explain the direct combustion and gasification method of using biomass fuel for power generation. **[CO-2, L-U]**

****End****

EVEN 2025-26 **EE23104**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Electrical Engineering (Sandwich Pattern)**
Course Title : **D.C. Machines & Transformer**

2:30 Hours / 60 marks Enrolment No.

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate **full** marks for the question.
5. Assume suitable additional data, if necessary.
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. State the types of armature winding incase of d.c. machines. **[CO-1, L-R]**
b. State the working principle of d.c. generator. **[CO-2, L-R]**
c. State the necessity of starter for d.c. motor. **[CO-3, L-R]**
d. State the principle of operation of d.c. motor. **[CO-3, L-R]**
e. State the types of single phase transformer based on construction. **[CO-4, L-R]**
f. Define ideal transformer. **[CO-4, L-R]**
g. Define voltage regulation of transformer. **[CO-4, L-R]**
h. Justify "Why transformer rated in kVA". **[CO-4, L-U]**
i. State the cooling methods for 3 phase transformer. **[CO-5, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Draw the labelled construction of d.c. machines and state the materials used for commutator and brushes. **[CO-1, L-U]**
b. Derive the emf equation for transformer. **[CO-4, L-U]**
c. Describe the Scott connection (three phase to two phase conversion). **[CO-5, L-U]**
d. Describe construction features of isolation transformer. **[CO-6, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. Describe the concept and significance of back emf. **[CO-3, L-U]**
b. Draw the vector diagram of transformer when load is inductive. **[CO-4, L-U]**
c. Compare three phase transformer with bank of three single phase transformer. **[CO-5, L-U]**
d. Explain working of current transformer with neat sketch. **[CO-6, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. Compare lap and ware winding incase of d.c. machine. **[CO-1, L-U]**
b. A d.c. motor takes an armature current of 110A at 480V. The armature circuit resistance is 0.2Ω. The machine has 6 poles and the armature is lap connected with 864 conductors. The flux per pole is 0.05wb. Calculate (i) the speed and (ii) the gross torque developed in the armature. **[CO-3, L-A]**

c. Describe the O.C. test on transformer with neat diagram. **[CO-4, L-U]**
d. Draw connection for yd11 with phasor diagram. **[CO-5, L-U]**
e. List the conditions for parallel operation of three phase transformer. **[CO-5, L-A]**

Q. 5 Attempt any TWO **12 Marks**

a. A long shunt compound generator gives 240 volts at F.L. output of 100A. The resistances of various windings of the machine are : armature (including brush contact) 0.1Ω, series field 0.02Ω, shunt field 100Ω. The iron loss at F.L. is 1000w, windage and friction losses total 500W, calculate F.L. efficiency of the machine. **[CO-2, L-A]**
b. State the types of starter used for D.C. motor and explain with neat diagram the working of 3-point starter. **[CO-3, L-U]**
c. Define all day efficiency. Find the all day efficiency of 500kVA distribution transformer whose copper loss and iron loss at full load are 4.5 Kw and 3.5 Kw respectively. During a day of 24 hours, it is loaded as under : **[CO-4, L-A]**

No. of Hours	Loading in Kw	Power Factor
6	400	0.8
10	300	0.75
4	100	0.8
4	0	-

****END****

EVEN 2025-26

EE23113

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Electrical Engineering (Sandwich Pattern)**
Course Title : **Testing & Maintenance of Electrical Equipments**

2:30 Hours/ 60 marks Enrolment No.

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. State the various factors on which severity of electric shock depends. **[CO-1, L-R]**
b. Define the terms : (i) Competency (ii) Risk Assessment. **[CO-1, L-R]**
c. State the concept of TPM. **[CO-1, L-R]**
d. State the methods for reducing soil resistance. **[CO-1, L-U]**
e. State all types of faults of transformer. **[CO-3, L-R]**
f. Enlist the type tests of 1-ph induction motor. **[CO-2, L-R]**
g. State the check list of 3-ph induction motor. **[CO-2, L-R]**
h. State the various factors affecting life of insulating materials. **[CO-5, L-R]**
i. State the methods of purification of insulating oil. **[CO-5, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Explain three terminal method of testing of earth resistance. **[CO-2, L-U]**
b. State the methods of providing artificial respiration. Explain any one in details. **[CO-1, L-U]**
c. Explain the routine maintenance of distribution transformer. **[CO-2, L-U]**
d. Explain the procedure of reduced voltage running up test on 3-ph induction motor. **[CO-2, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. Explain the concept of routine and preventive maintenance. **[CO-2, L-U]**
b. Explain the factors affecting preventing maintenance schedule. **[CO-2, L-U]**
c. Prepare the troubleshooting chart for 1-ph induction motor. **[CO-3, L-U]**
d. Explain vacuum impregnation methods of varnishing. **[CO-5, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. Explain the different types of fire extinguishers and their operation. **[CO-1, L-U]**
b. Explain the measurement of winding resistance. **[CO-3, L-U]**
c. Explain the maintenance schedule of alternator. **[CO-4, L-U]**
d. State the classifications and applications of insulating materials in details. **[CO-5, L-U]**
e. List any eight agents that contaminate the insulating oil. **[CO-5, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. Explain S.C. test to be carried out on 1kVA, 230/110V transformer with neat diagram. State the formula for calculating copper loss. **[CO-2, L-A]**

b. Prepare trouble shooting chart of 3-ph transformer and remedial measures. **[CO-4, L-A]**

c. Prepare a preventive maintenance schedule of 3-ph induction motor. **[CO-4, L-A]**

****End****

EVEN 2025-26

EE23210

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Electronic Engineering (Sandwich Pattern)**
Course Title : **Fundamentals of Electrical Engineering**

2:30 Hours/ 60 marks Enrolment No.

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS.

Q.1 **Attempt any SIX** **12 Marks**

a. Define Electric current and electric potential. **[CO-1, L-R]**
b. State Kirchhoff's current law. **[CO-2, L-R]**
c. Draw symbols of
   (i) Ideal constant voltage source.
   (ii) Ideal constant current source. **[CO-2, L-R]**
d. State different between unilateral circuit and bilateral circuit. **[CO-2, L-U]**
e. Give mathematical expression of alternating quantity (AC). **[CO-4, L-R]**
f. Define i) Amplitude ii) frequency for a waveform. **[CO-4, L-R]**
g. State classification of transformer. **[CO-5, L-R]**
h. Define i) Efficiency ii) Voltage ratio for transformer. **[CO-5, L-R]**
i. State types of fuse. **[CO-6, L-R]**

Q.2 **Attempt any THREE** **12 Marks**

a. Define Resistance and state factors on which resistance depends. **[CO-1, L-U]**
b. Refer circuit shown in fig (a) and find current's I_1 and I_2.

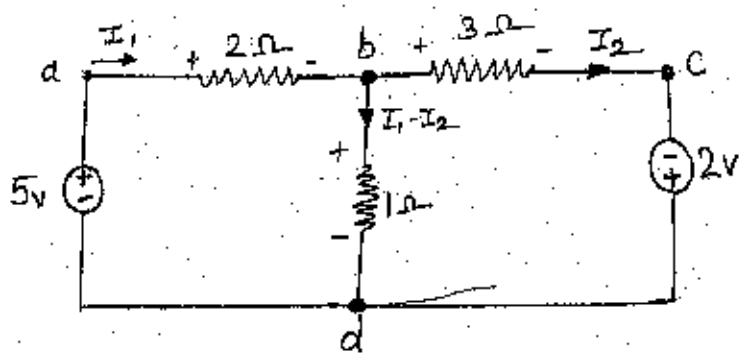


fig 2b

[CO-2, L-A]

c. Compare Magnetic circuit and Electric circuit (Any four points). **[CO-3, L-A]**

d. Define single phase A.C. circuit with pure capacitor. Draw its input and output waveforms and phasor diagram. **[CO-4, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. A LED operates with 0.072A current and 25Ω resistance calculates the power & energy consumed in 10 seconds. **[CO-1, L-A]**

b. Explain concept of open circuit and short circuit with the help of diagrams. **[CO-2, L-U]**

c. Explain concept of mutually induced E.M.F. with neat diagram. **[CO-3, L-U]**

d. Compare Autotransformer with two winding transformer (any four points). **[CO-5, L-A]**

Q. 4 Attempt any FOUR **12 Marks**

a. Write statements of followings
i) Fleming Right Hand Rule.
ii) Lenz's law. **[CO-3, L-U]**

b. Draw Hysteresis loops for Hard and Soft Magnetic Materials. **[CO-3, L-A]**

c. Compare A.C. quantity and D.C. quantity (Any three points). **[CO-4, L-A]**

d. An AC voltage is given by $V(t)=200\sin(3\pi t)$ v
Find its i) Peak value ii) frequency iii) R.M.S value. **[CO-4, L-A]**

e. State precautions to be taken if person gets an electric shock. **[CO-6, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. State types of effect of electric current. Explain each in short with applications. **[CO-1, L-A]**

b. Draw constructional diagram of a transformer. Write brief description of each part with its function. **[CO-5, L-A]**

c. Define earthing. State its necessity Explain plate earthing with neat diagram. **[CO-6, L-U]**

****End****

EVEN 2025-26 **EE23111**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Electrical Engineering(Sandwich Pattern)**
Course Title : **Electrical Estimation and Costing**

2:30 Hours/ 60 marks Enrolment No.

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS.

Q.1 Attempt any SIX **12 Marks**

a. State the types of electrical installation. **[CO1, L-R]**
b. Enlist the types of contract. **[CO2, L-R]**
c. Define tender and quotation. **[CO2, L-R]**
d. Give the examples of commercial installation.(Any four) **[CO3, L-R]**
e. State the types of Non-industrial installation. **[CO3, L-R]**
f. Give the name of starter used for following motors:
1)3-Ø, 5HP squirrel cage I.M. 2) 3-Ø,15HP squirrel cage I.M. **[CO4, L-U]**
g. List out the light sources used in public light installation. **[CO5, L-R]**
h. Classify outdoor installation. **[CO5, L-R]**
i. List out the factors determining the selection of LT power cables. **[CO6, L-U]**

Q.2 Attempt any THREE **12 Marks**

a. Describe the scope and features of NEC 2011. **[CO1, L-U]**
b. A residential unit is having following load:
1) 4 lamps of 60W each 2) 6 lamps of 40W each 3) 4 ceiling fans of 60W each
4) 6 sockets of 6 A, 100W each 5) 4 sockets of 16 A, 1000 W each.
Calculate: i) Total lighting load ii) Total power load.
iii) Size of D.B. iv) No. of lighting and power sub-circuit. **[CO3, L-A]**
c. Draw wiring diagram and single line diagram of 3-Ø, 5HP squirrel cage I.M. **[CO4, L-U]**
d. List out cable laying and cable termination methods in distribution line. **[CO6, L-R]**

Q. 3 Attempt any THREE **12 Marks**

a. Describe the factors to be considered for preparation of detailed estimate and economical execution of work. **[CO2, L-U]**
b. Decide the rating of main switch, motor switch, distribution board and cable for a industrial installation of having 2 motors of 3 HP and 5 HP. **[CO4, L-A]**
c. List out the material and control devices required for street light installation. **[CO5, L-U]**
d. Compare overhead and underground distribution line.(Eight points) **[CO6, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. Describe the procedure for placing of purchase order. **[CO2, L-U]**
b. Explain the earthing of commercial installation. **[CO3, L-U]**
c. Describe the design.consideration of electrical installation in industry. **[CO4, L-U]**
d. Draw and explain street light pole structure. **[CO5, L-U]**
e. Draw the single line diagram of 11 KV Distribution substation. **[CO6, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. Explain design procedure of commercial installation for in detail estimation and costing for electrical installation. **[CO3, L-U]**
b. A road 300m long is required to be illuminated by providing 40W fluorescent lamps with 222 candle power, the width of road is 4 mtr. Design a street lighting scheme and estimate the material required if the scheme is to be estimated for obtaining minimum level of illumination of 0.8 lux. **[CO5, L-A]**
c. State different types of contracts. Explain each types of contracts.**[CO2, L-U]**

****End****

EE23108

EVEN 2025-26

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Electrical Engineering (Sandwich Pattern)**
Course Title : **Utilisation of Electrical Energy**

2:30 Hours / 60 marks Enrolment No.

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO-COURSE OUTCOMES, L=LEVELS.

Q.1 Attempt any SIX **12 Marks**

a. State the advantages of electric heating. (any two) **[CO-1, L-R]**
b. State the methods of heat transfer. **[CO-1, L-R]**
c. State the principle of resistance welding. **[CO-2, L-R]**
d. Give the application of electric arc welding. **[CO-2, L-U]**
e. Enlist various types of electric drives used in industry. **[CO-3, L-U]**
f. Define load equalization. **[CO-3, L-U]**
g. Draw the Speed time characteristics of suburban railway services. **[CO-4, L-U]**
h. State the working principle of Mono rail. **[CO-4, L-R]**
i. State the various types of electric elevators. **[CO-5, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Explain with neat sketch, the working principle of dielectric heating. **[CO-1, L-U]**
b. Compare resistance welding and arc welding on the basis of i) Supply requirement ii) Voltage iii) Power factor iv) Temperature **[CO-2, L-U]**
c. Define electric drive. State the two advantages associated with electric drives. **[CO-3, L-U]**
d. Draw the block diagram of 25 kV, 50 Hz, 1 phase A.C. locomotive used for traction system. State the function of each part. **[CO-4, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. Explain with neat sketch the construction and operation of indirect arc furnace. **[CO-1, L-U]**
b. Describe with neat sketch the working principle of Spot welding and state its application. **[CO-2, L-U]**
c. Compare D.C. and A.C. system of railways track electrification from the point of main line & suburban line railways service. **[CO-4, L-U]**
d. Give any four requirements of elevators. **[CO-5, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. State any six applications of dielectric heating. **[CO-1, L-R]**

b. With the help of neat figure explain ultrasonic welding. State its applications. **[CO-2, L-U]**

c. Explain in brief with neat sketch rheostatic braking for D.C. series motor. **[CO-3, L-U]**

d. State any three requirements of ideal traction system. **[CO-4, L-U]**

e. State the factors to be considered for selection of shape and size of the car of an elevator. **[CO-5, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. i) State and explain causes of failure of resistance heating element.
ii) State the different methods of temperature control of resistance furnace /oven. **[CO-1, L-R]**

b. Enumerate the factors governing selection of electric drives for a particular service / application. **[CO-3, L-U]**

c. A train runs with average speed of 30 km/hr. Distance between station is 2.5 km. Values of acceleration and retardation are 1.5 km/h/s and 2.5 km/h/s respectively. Find the maximum speed of train assuming trapezoidal speed time curve. **[CO-4, L-A]**

****End****

EVEN 2025-26 **EE23107**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Electrical Engineering (Sandwich Pattern)**
Course Title : **Electrical Measurement & Transducer**

2:30 Hours / 60 marks Enrolment No. | | | | | | | | | | |

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. State effects of electricity employed in electrical measuring instrument. **[CO-1, L-R]**
b. State classification of instrument based on limits of permissible errors. **[CO-1, L-U]**
c. State methods of production of torque. **[CO-2, L-U]**
d. State advantages of digital ammeter. **[CO-2, L-U]**
e. Define active power and reactive power. **[CO-3, L-R]**
f. State demerits of analog wattmeter. **[CO-3, L-U]**
g. State concept of electrical energy. **[CO-4, L-R]**
h. State working principle of RTD. **[CO-5, L-R]**
i. Draw neat diagram of diaphragm. **[CO-5, L-U]**

Q.2 Attempt any THREE **12 Marks**

a. Draw and explain photo conductive cell with application. **[CO-5, L-U,A]**
b. State merits and demerits of three phase electronic energy meter. **[CO-4, L-U]**
c. Explain measurement of reactive power in three phase balanced load by two wattmeter method. **[CO-3, L-U]**
d. Draw and explain working principle of MI type instrument. **[CO-2, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. State types of strain gauges and explain any one. **[CO-5, L-R]**
b. Explain methods of extending range of ammeter. **[CO-3, L-U]**
c. Explain calibration of three phase energy meter. **[CO-4, L-U]**
d. Explain effect of power factor variation on wattmeter reading in wattmeter method. **[CO-3, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. Explain ultrasonic flow meter with diagram. **[CO-5, L-U]**
b. State methods of measurement of low, medium and high resistance. **[CO-2, L-U]**
c. State different types of errors in energy meter. **[CO-3, L-U]**

d. Compare digital wattmeter with analog wattmeter on any three points. Also state one application of each. **[CO-3, L-U,A]**

e. State classification of instruments based on i) Electrical effects. ii) Nature of operation. **[CO-1, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. State types of pyrometer and explain any one with diagram and application. **[CO-5, L-U,A]**

b. Explain import export type energy meter with neat diagram and application. **[CO-4, L-U,A]**

c. Explain measurement of digital frequency meter with diagram and application. **[CO-3, L-U]**

****End****

EVEN 2025-26 **EE23101**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Electrical Engineering**
Course Title : **Basic Electrical Engineering**

2:30 Hours / 60 marks Enrolment No.

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. Define Electric Potential and state its Unit. **[CO1, L-R]**
b. State ohm's law for D.C. circuit. **[CO1, L-R]**
c. Define bilateral circuit and unilateral circuit. **[CO2, L-R]**
d. Define ideal and practical voltage source represent them by symbol. **[CO2, L-R]**
e. State Kirchoff's current law. **[CO2, L-R]**
f. Define Dielectric strength and state its unit. **[CO3, L-R]**
g. State which type of capacitor is used in a ceiling fan and what is its rating? **[CO3, L-A]**
h. Define the following terms i) Magnetic Flux Density ii) Reluctance. **[CO4, L-R]**
i. State Feraday's law of electromagnetic induction. **[CO4, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Define resistance and specific resistivity,states the factors on which resistance of a conductor depends. **[CO1, L-R]**
b. State various effects of electric current,state two examples of each **[CO1, L-U]**
c. A resistance of 1KΩ is connected across a 12 V battery for 2 hours. Calculate the power dissipated in the resistor and energy associated with it. **[CO1, L-A]**
d. Find the value of battery voltage in the circuit of figure(a) **[CO1, L-A]**

Q. 3 Attempt any THREE **12 Marks**

a. Sate Krichoffs voltage law. Explain sign convention by considering suitable circuit. **[CO2, L-U]**
b. Explain the factors on which capacitance of a parallel plate capacitor depends. **[CO3, L-R]**
c. State the equation of current in the capacitor while charging and discharging. Plot i in both cases with respect to time. **[CO3, L-U]**

d. Three capacitors have capacitances of 4μF,8μF and 10μF respectively. Find the total capacitances when they are connected in a) Parallel b)Series. **[CO3, L-A]**

Q. 4 Attempt any FOUR **12 Marks**

a. Compare electric circuit and magnetic circuit (any tow similarities and two dissimilarities) **[CO4, L-R]**
b. Explain B-H curve for a magnetic circuit. **[CO4, L-A]**
c. Draw Hysteresis loop for Hard and Soft magnetic material. **[CO4, L-R]**
d. Explain Fleming left hand rule and Fleming right hand rule. **[CO4, L-R]**
e. Explain mutually induced emf and mutual inductance with the help of neat diagram. **[CO4, L-R]**

Q. 5 Attempt any TWO **12 Marks**

a. For the network given in figure(b) Determine equivalent resistances between points i) B and C ii) A and N **[CO2, L-A]**
b. Define the following terms i) Waveform ii) Cycle iii) Periodic time iv) frequency v) amplitude vi) instantaneous value. **[CO5, L-R]**
c. An alternating current is given by i=141.4 sin 314t find i) Maximum value ii) frequency iii) time period iv) instantaneous value when t is 3 msec. **[CO5, L-A]**

****End****

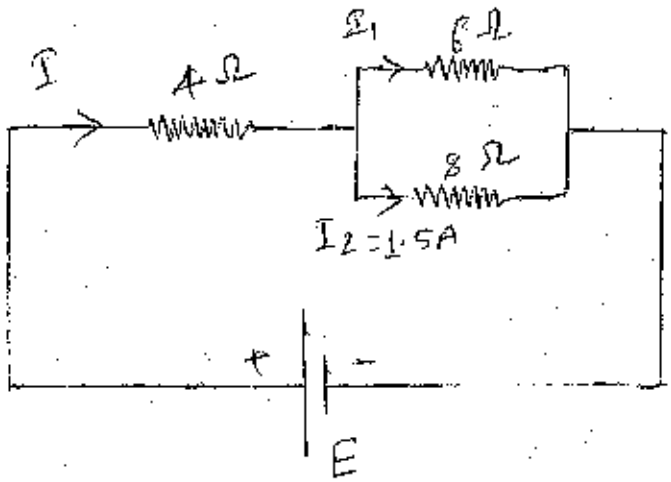


Fig. (a) Q.2 (d)

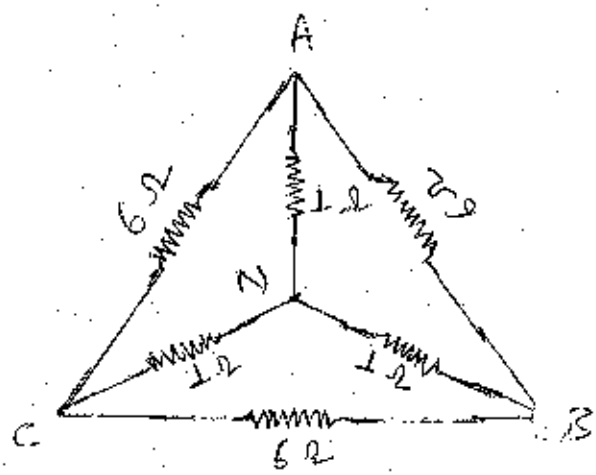


Fig. (b) Q.5 (a)

EVEN 2025-26

EE23701

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Electrical Engineering (Sandwich Pattern)**
Course Title : **Internet of Things**

2:30 Hours / 60 marks Enrolment No.

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. State any four benefits of cloud computing services. **[CO-1, L-R]**
b. State working principle of PIR sensor. **[CO-3, L-R]**
c. State working principle of MQ4 gas sensor. **[CO-3, L-R]**
d. State working principle of LM35 temperature sensor. **[CO-3, L-R]**
e. Define – i) Network ii) Protocol. **[CO-4, L-R]**
f. State the functions of following network devices i) Router ii) Bridge. **[CO-4, L-R]**
g. Enlist the names of any two unique identifiers of network. **[CO-4, L-R]**
h. State any two benefits of using computer network. **[CO-4, L-R]**
i. Enlist the two sensors that are used in smart homes. **[CO-5, L-A]**

Q.2 Attempt any THREE **12 Marks**

a. Draw Arduino pin diagram. Explain the function of Tx and Rx pin. **[CO-2, L-U]**
b. Draw an interface diagram of DHT-22 or DHT-11 humidity sensor with Arduino. Also mention two important specifications of DHT-22 or DHT-11. **[CO-3, L-A]**
c. Draw an interface diagram of gas sensor (MQ4 or MQ6) with Arduino. Also mention two important specifications of gas sensor MQ4 or MQ-6. **[CO-3, L-A]**
d. List the four types of IOT communication. Explain any one in detail. **[CO-4, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. Explain the working principle of DC motor and draw interface diagram of DC motor with Arduino. **[CO-3, L-A]**
b. Explain the working principle of stepper motor and draw interface diagram of stepper motor with Arduino. **[CO-3, L-A]**
c. Explain any four IOT technology development challenges. **[CO-5, L-U]**
d. Explain the application of IOT in smart agriculture. **[CO-5, L-A]**

Q. 4 Attempt any FOUR **12 Marks**

a. Explain request-response IOT communication model. **[CO-1, L-U]**

b. State any three advantages and three disadvantages of IOT. **[CO-1, L-U]**

c. Write the three steps to program an Arduino. **[CO-2, L-R]**

d. State and write any three basic functions used in Arduino programming. Also mention their use. **[CO-2, L-U]**

e. Explain how DNS works. **[CO-4, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. List any three IOT enabling technologies. Explain any one in detail. **[CO-1, L-U]**

b. Write an Arduino sketch (program) to "Read a potentiometer, print its state out to the Arduino serial monitor". **[CO-2, L-A]**

c. Explain the IOT applications in smart transportation related to i) Efficient traffic management ii) Automated toll and ticketing iii) Self driving cars. **[CO-5, L-A]**

****End****

EVEN 2025-26 **EE23109**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Electrical Engineering (Sandwich Pattern)**
Course Title : **A. C. Machines**

2:30 Hours / 60 marks Enrolment No.

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L- LEVELS

Q.1 Attempt any SIX **12 Marks**

a. Define slip of induction motor. **[CO-1, L-R]**
b. State the types of 3-phase induction motor based on construction. **[CO-1, L-R]**
c. State the list of starters used for starting of 3-phase induction motor. **[CO-2, L-R]**
d. Define synchronous speed and write the equation for the same. **[CO-1, L-R]**
e. State the conditions for parallel operation of an alternator. **[CO-3, L-R]**
f. State the types of rotor used in alternator with application. **[CO-3, L-R]**
g. State the list of synchronizing methods for an alternator. **[CO-3, L-R]**
h. Draw phasor diagram of a synchronous motor operating at lagging power factor. **[CO-4, L-U]**
i. Define synchronous condenser related to synchronous motor. **[CO-4, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Derive the equation for starting torque of 3-phase induction motor. **[CO-1, L-U]**
b. State various methods to control speed of 3-phase induction motor and explain any one method. **[CO-2, L-U]**
c. Describe the factors affecting the terminal voltage of 3-phase alternator. **[CO-3, L-U]**
d. State the reason why single phase induction motor is not self starting & mention any one method of starting. **[CO-5, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. Explain with a neat wiring diagram the working of star-delta starter. **[CO-2, L-U]**
b. A 3-phase, 16 pole alternator has a star, connected winding with 114 slots and 10 conductors per slot. The flux per pole is 0.03Wb, sinusoidally distributed and the speed is 375 r.p.m. Find the frequency in Hz and the phase and line emf. Assume full pitched coil. **[CO-3, L-A]**
c. State the reason why synchronous motor is not self starting. Explain briefly the starting methods used in practice. **[CO-4, L-U]**

d. Explain with neat diagram the construction of capacitor split phase single phase induction motor. **[CO-5, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. Draw and explain torque-slip curves of a 3-phase induction motor. **[CO-1, L-U]**

b. Compare squirrel cage and slip ring induction motor on the basis of i) Starting torque ii) Power factor iii) Speed control. **[CO-1, L-U]**

c. Explain induction motor as generalized transformer. **[CO-2, L-U]**

d. State the applications of 3-phase synchronous motor. **[CO-4, L-R,U]**

e. Draw the power flow diagram for synchronous motor. **[CO-4, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. Explain with neat sketch the production of rotating magnetic field in 3-phase induction motor. **[CO-1, L-U]**

b. A 3-phase 149kW, 400V, induction motor gave the following test readings : No load – 400V, 9A,1250W, Blocked rotor –: 150V, 38A, 4000W. Rotor copper losses are equal to half the total copper losses at stand still. Draw circle diagram and find full load values of current, power factor and slip. **[CO-2, L-A]**

c. State the need of parallel operation of 3-phase alternator. Draw & explain one dark two bright lamp synchronizing method. **[CO-3, L-R/U]**

****End****

EVEN 2025-26 **EE23106**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Electrical Engineering (Sandwich Pattern)**
Course Title : **Electrical Transmission & Distibution**

2:30 Hours / 60 marks Enrolment No. | | | | | | | | | | |

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. State ACSR conductor. **[CO-1, L-R]**
b. State advantages & disadvantages of corona. **[CO-1, L-R]**
c. State the different voltage levels of HVAC & HVDC. **[CO-1, L-R]**
d. State skin effect. **[CO-1, L-R]**
e. State classification of distribution system. **[CO-1, L-R]**
f. State the classification of cable. **[CO-1, L-R]**
g. Draw the diagram of pf improvement using static capacitor. **[CO-1, L-R]**
h. State the advantages of pf improvement. **[CO-4, L-R]**
i. Draw single line diagram of 33 kV / 11 kV substation. **[CO-4, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Explain wooden poles supports with neat diagram. state its disadvantages. **[CO-1, L-U]**
b. State & explain the factors affecting corona. **[CO-1, L-U]**
c. Compare between EHVAC & HVDC on eight points. **[CO-1, L-U]**
d. Explain Interconnected distribution system with neat diagram. **[CO-1, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. Define Sag. Derive the equation of Sag, due to effect of wind & ice loading. **[CO-1, L-U]**
b. Explain End condenser method of medium transmission line with phasor diagram. State all the equations. **[CO-2, L-A]**
c. Explain Back to Back HVDC transmission system. **[CO-1, L-U]**
d. Explain the components of Distribution system with neat diagram. **[CO-1, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. Explain Line In Line Out (LILO) system with diagram. **[CO-1, L-U]**
b. Compare overhead lines with underground cables with six points. **[CO-1, L-U]**
c. State the functions of following in cables.
i) Metallic sheath ii) Armouring iii) Beading **[CO-1, L-U]**
d. State the causes of low p.f. **[CO-4, L-U]**
e. State the substation equipments & their functions. **[CO-4, L-U]**

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Q. 5 Attempt any TWO **12 Marks**

a. A 3 phase transmission line is suspended lay a string of 3 similar disc insulators. If the voltage across the line unit is 17.5 kV, calculate the line to neutral voltage. Assume that the shunt capacitance between each insulator & earth is 1/8th of capacitance of the insulator itself. Also find string efficiency. **[CO-1, L-A]**

b. A single phase overhead transmission line delivers 1100 kW at 33 kV at 0.8 p.f. lagging. The total resistance & inductive reactance of the line are 10 Ω & 15 Ω respectively. Determine i) Sending end voltage ii) Sending end pf iii) Transmission efficiency. **[CO-2, L-A]**

c. Derive the equations of sending end voltage & sending end current of AC distribution system when power factors referred to receiving end voltage. Draw the phasor diagram. **[CO-2, L-A]**

****End****